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USE OF BREAST MILK FROM MILK DISPENSARY BY BABIES IN NEONATAL INTENSIVE CARE UNITS

Utilização de leite materno em lactário por bebês internados em unidades de terapia intensiva

Utilización de la leche materna en lactario de bebés ingresados en unidades de cuidados intensivos

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ABSTRACT

Objective: To assess the amount of breast milk collected and destined for the Neonatal Intensive Care Unit (ICU) at a baby-friendly hospital in the South of Brazil. **Methods:** An analytical, observational cross-sectional study, carried out in the milk dispensary of Caxias do Sul General Hospital, in the period from July to December 2016. Data on the amount of breast milk was collected, considering: total intake for all hospital units, entry and exit of milk destined for the Neonatal ICU, and discarded amounts due to discharge/death, expired thaw and expired validity. Categorical variables are presented in absolute numbers and percentages and continuous variables as mean ± standard deviation. Statistical analysis was performed using the Statistical Package for Social Sciences (SPSS), version 20.0, considering $p<0.05$ as statistical significance level. **Results:** The total milk intake to the milk dispensary was 177,053 mL; the breast milk entry to the Neonatal ICU was 153,898 mL, and 87.21% of this volume was used. The disposal figures due to discharge/death, thaw and validity represented 4.04, 1.14 and 0.55%, respectively. The mean daily milk expression in the semester for the Neonatal ICU was 836.40 ± 382.67 mL, and the mean daily consumption of human milk for the Neonatal ICU was 729.44 ± 341.54 mL. **Conclusion:** The milk dispensary presented a high percentage of human milk expression and consumption and a low disposal, demonstrating a good storage control and its value within the baby-friendly hospital.

Descriptors: Milk, Human; Intensive Care Units, Neonatal; Milk Banks; Breast Milk Expression.

RESUMO

Objetivo: *Avaliar a quantidade de leite materno coletado e com destino à Unidade de Terapia Intensiva (UTI) Neonatal, em um hospital amigo da criança, no Sul do Brasil.* ***Métodos:*** *Estudo observacional, transversal e analítico, realizado no lactário do Hospital Geral de Caxias do Sul, no período de julho a dezembro de 2016. Foram coletados dados da quantidade de leite materno, considerando: entrada total para todos os setores, entrada e saída com destino à UTI Neonatal, desprezos por alta/óbito, degelo vencido e validade expirada. As variáveis categóricas estão apresentadas em números absolutos e percentuais e variáveis contínuas, como média ± desvio padrão. Realizou-se análise estatística através do programa Statistical Package for Social Sciences (SPSS), versão 20.0, considerando significância estatística $p<0,05$.* ***Resultados:*** *O valor de entrada total no lactário foi de 177.053 mL, a entrada de leite materno para a UTI Neonatal apresentou-se em 153.898 mL, e teve como saída 87,21% desse volume. Os números de desprezo representaram 4,04, 1,14 e 0,55%, respectivamente, sendo por alta/óbito, degelo e validade. A média diária do semestre de esgota para a UTI Neonatal foi 836,40±382,67 mL, e a média diária de utilização de leite materno para a UTI Neonatal de 729,44±341,54 mL.* ***Conclusão:*** *O lactário apresentou alta porcentagem de esgota e utilização de leite materno e baixo desprezo, demonstrando bom controle de armazenamento e sua importância dentro do hospital amigo da criança.*

Descritores: *Leite Humano; Unidades de Terapia Intensiva Neonatal; Bancos de Leite; Extração de Leite.*

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RESUMEN

Objetivo: *Evaluar la cantidad de leche materna extraída y destinada a la Unidad de Cuidados Intensivos (UCI) Neonatal de un hospital amigo del niño en el Sur de Brasil.* ***Métodos:*** *Estudio observacional, transversal y analítico realizado en el lactario del Hospital General de Caxias del Sur en el período entre julio y diciembre de 2016. Se recogieron los datos de la cantidad de leche materna considerando la entrada total para todos los sectores, la entrada y salida para la UCI Neonatal, el desprecio por la alta/el óbito, el deshielo caducado y la validez espirada. Las variables categóricas se presentan con valores absolutos y porcentuales y las variables continuas con la media ± desviación típica. Se realizó un análisis estadístico a través del programa Statistical Package for Social Sciences (SPSS) versión 20.0 con la estadística significativa de p<0,05.* ***Resultados:*** *El valor de la entrada total en el lactario ha sido de 177.053 ml, la entrada de la leche materna para la UCI Neonatal ha sido de 153.898 ml y la salida del 87,21% de ese volumen. Los números del desprecio representaron el 4,04, 1,14 y el 0,55%, respectivamente, por la alta/el óbito, el deshielo y la validez. La media diaria del semestre de la leche agotada para la UCI Neonatal ha sido de 836,40±382,67 ml y la media de la utilización de la leche materna para la UCI Neonatal a diario de 729,44±341,54 ml.* ***Conclusión:*** *El lactario presentó alto porcentaje de la leche agotada y de la utilización de la leche materna y bajo desprecio lo que señala un buen control de almacenamiento y su importancia para el hospital amigo del niño.*

Descriptores: *Leche Humana; Unidades de Cuidado Intensivo Neonatal; Bancos de Leche; Extracción de Leche Materna.*

INTRODUCTION

From an evolutionary, nutritional and economic point of view, human milk is the ideal food for the baby in the first months of life. Exclusive breastfeeding (EBF) for the first six months, followed by breastfeeding supplemented with adequate food for one year or more, remains as the recommendation of the American Academy of Pediatrics[1], the Centers for Disease Control and Prevention[2] and the World Health Organization (WHO)[3].

Currently, the average duration of EBF is still short in some countries, such as Portugal, where it is only 2 months[4]. In most high-income countries, the prevalence is below 20%, with a significant difference between the United Kingdom (<1%) and the United States (27%), and between Norway (35%) and Sweden (16%)[5]. In Africa, South Asia and parts of Latin America, the prevalence of breastfeeding up to 12 months is the highest[5]. In Brazil, EBF rates are on the rise, but are still well below WHO recommendations[3]. The II National Survey of Prevalence of Breastfeeding in the Brazilian Capitals and Federal District, carried out in 2008, revealed a 41% prevalence of exclusive breastfeeding among children under six months in Brazil[6]. The median duration of EBF in children under six months was 54 days[6]. Data from the year 2013 indicates a prevalence of 36.6% of EBF up to six months and 52.1% of breastfeeding in Brazil[7].

Human breast milk (HBM) is a complex matrix with an overall composition of 87% water, 3.8% fat, 1% protein and 7% lactose. Fat and lactose, respectively, provide 50% and 40% of the total milk energy[8]. The milk of mothers of preterm infants presents higher concentrations of protein, sodium, calcium, lipids and anti-infective features[9]. With regard to proteins, colostrum - the first secretion of the mammary glands - is rich in protective proteins, especially the secretory immunoglobulin A, which acts against infections and food allergy. Mature milk, in comparison to colostrum, contains more nutritive proteins (casein and whey proteins)[10].

Adequate nutrition in early life is an important factor for developmental outcomes, such as neurodevelopment and later cognitive abilities[11]. Several evidences point to the benefits of breast milk in children's health, among which, a variety of bioactive agents modify the function of the gastrointestinal tract and the immune system, and also aid the brain development. Studies evidence that a higher volume of breast milk during the stay in a Neonatal Intensive Care Unit (NICU) is beneficial for the cognitive development of preterm newborns[12]. Thus, the HBM is widely recognized as a biological fluid necessary for the baby's optimal growth and development, especially during a hospital stay. Moreover, HBM reduces the risk of developing late metabolic diseases, particularly protecting against obesity and type II diabetes mellitus[8].

The Baby-Friendly Hospital Initiative is an important strategy for improvement of the breastfeeding practice. Current recommendations for promotion, maintenance and support of breastfeeding in the NICU include: training of specific staff and information on the benefits and challenges of breastfeeding, avoiding mother-to-baby separation, promoting skin-to-skin interaction, discouraging bottle-feeding, helping mothers initiate milk expression shortly after birth and guiding the use of an electric breast pump[13].

The amount of breast milk consumed in a NICU is important to evaluate the functioning of the milk dispensary, the mothers' rate of milk expression and, mainly, the receipt of HBM by the hospitalized babies, who are predominantly premature. Nevertheless, this subject has so far been little studied. Based on the above, the present study was aimed at evaluating the amount of breast milk collected and consumed in the NICU of a child-friendly hospital located in the South region of Brazil.

METHODS

This is a cross-sectional, observational, descriptive and analytical study, which collected data on the inflow and outflow of human milk of the milk dispensary of Caxias do Sul General Hospital, Rio Grande do Sul, Brazil, in the period from July to December 2016.

Data was collected from spreadsheets of the sector during the first half of 2017, as follows: a) data on the total intake of HBM, represented by the sum total of the volume of HBM collected from all mothers who expressed in the milk dispensary during that period and for all hospital units, whether the HBM was donated by mothers of infants hospitalized in the NICU or not; b) data on the total inflow of milk destined for the NICU, that is, the volume of HBM expressed only by mothers of NICU babies; c) data on the outflow of HBM that was destined for the NICU, referring to the quantity of HBM expressed by NICU nursing mothers, stored by the milk dispensary and destined for use in the NICU, not remaining stored until the limit of validity, and (d) data on disposal due to expiration date (> 15 days after freezing), expired thaw (> 12 hours after thawing)[14], hospital discharge or death. Data on disposal due to impurities was collected but later removed from the estimates, since such data is not stored in the intake record, but rather in another spreadsheet of the hospital unit.

The data was then entered in an Excel spreadsheet. Initially, the daily values of total intake, NICU inflow, NICU outflow, disposal due to impurities, disposal due to validity expiration, disposal due to expired thaw, and disposal due to discharge and death were added. The categorical variables are presented in absolute numbers and percentages, and the continuous variables as mean ± standard deviation. In addition, the variables are presented with monthly results (absolute numbers) and in the total period of six months. Kruskal-Wallis test was used for comparison of the evaluated months, since the distribution of the variables was non-parametric by the Shapiro-Wilk test. The correlation between HBM inflow and outflow in the NICU was obtained using Spearman's coefficient. Statistical analysis was performed in the Statistical Package for Social Sciences (SPSS), version 20.0, considering $p<0.05$ as statistical significance level.

The project was approved by the Scientific Editorial Board of Caxias do Sul General Hospital (Protocol 57/2015) and by the ethics committee of the University of Caxias do Sul, under Approval no. 1.714.478.

RESULTS

The analyzed values demonstrate that, in the period from July to December 2016, the total amount of HBM entering the milk dispensary was 177,053 mL. Of this total, 86.92% (153,898 mL) were milk expressed by mothers of infants admitted to the NICU of the general hospital. Of the total inflow of HBM destined for the NICU, 87.21% (134,216 mL) left the milk dispensary, being taken to the infants in the NICU. The HBM that entered the NICU and was not consumed was discarded due to the patient's discharge from hospital/death, expired thaw and expired validity, representing 4.04, 1.14 and 0.55% (6,219 mL, 1,751 mL and 844 mL, respectively) of the total amount received for the NICU. In the period, 23,609 mL of HBM were discarded because of impurities, having 131.16 mL as the daily average over the semester (Figure 1).

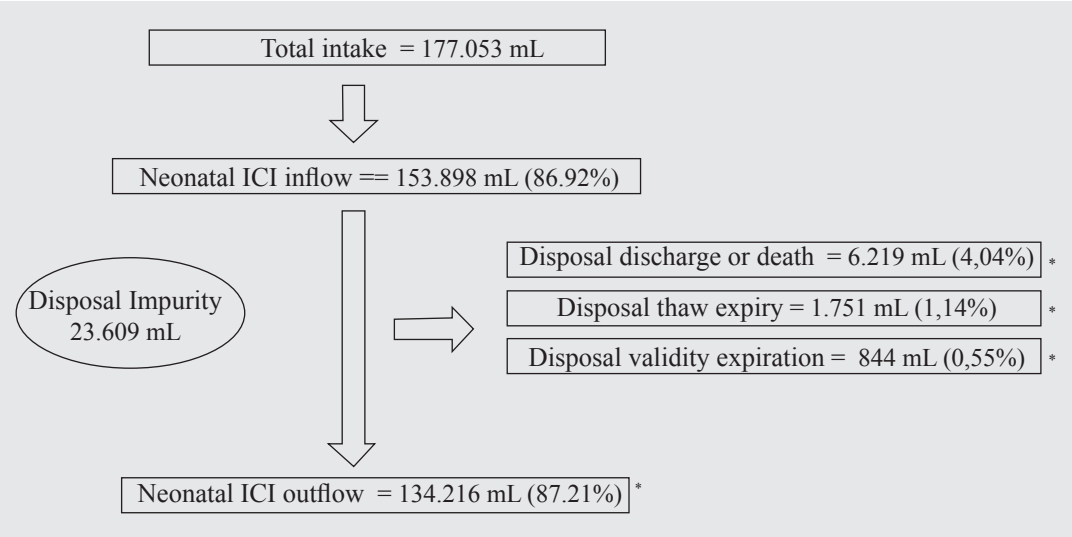

Figure 1 - Organogram of absolute values and percentages of inflow, outflow and disposal of human breast milk of the milk dispensary.

* Values of inflow, outflow and disposal do not add up to 100% because of the collection and use on a day before and one day after the period of data collection, since the human breast milk can be frozen and stored for 15 days after expression.

* Refers to the inflow of breast milk to the NICU - Neonatal Intensive Care Unit (Collected for the NICU). ICU: Intensive Care Unit.

Table I displays the variables and monthly values and the average over the period of six months in which they were studied. A difference between the values can be observed when comparing separately each month of the period. During the six months under analysis, the month of August had the highest volume of HBM received, 1,360.84 mL, whereas December was the month with the lowest intake, 749.35 mL. The highest values of total intake (1,230.03 and 1,360.84 mL, respectively) and NICU inflow (930.97 and 1,288.48 mL, respectively) were observed in the months of July and August, when compared to the other months ($p<0.001$). As for the outflow in the NICU, the month of July (777.06 mL) was statistically similar to August, and also similar to the other months, but August was statistically different from the others, presenting the highest value in the period (1,066.94 mL; $p<0.001$).

As for the disposal resulting from expired thaw, the highest volume (21.77 mL) occurred in July, and the lowest was in October (0.84 mL), with $p<0.001$ when compared to the other months. Disposal of milk due to discharge/death and expired validity are not statistically significant. The variables on disposal did not follow the proportional behavior of the variables of total NICU inflow and NICU outflow, since they depend on the patient's discharge and deaths and on the amount used per container of expressed HBM.

On average, there was an intake of 962.25 ± 423.75 mL of HBM per day in the milk dispensary. The daily average of HBM directly destined for the NICU over the semester was 836.40 ± 382.67 mL (Table I).

Table I - Amount of breast milk presented in monthly absolute values and daily average over the second semester of 2016 in the General Hospital milk dispensary. Caxias do Sul, Rio Grande do Sul, Brazil, 2016.

Variable/month	July	August	September	October	November	December	P-value	Daily average over the semester
Total Intake (mL)	1230.03 [a]	1360.84 [a]	767.00 [b]	851.94 [b]	802.87 [b]	749.35 [b]	<0.001	962.25 ± 423.75
NICU inflow (mL)	930.97 [a]	1288.48 [a]	717.43 [b]	682.26 [b]	719.17 [b]	672.48 [b]	<0.001	836.40 ± 382.67
NICU outflow (mL)	777.06 [ab]	1066.94 [a]	695.87 [b]	673.03 [b]	596.23 [b]	562.10 [b]	<0.001	729.44 ± 341.54
Disposal due to discharge/ death (mL)	4.84	124.68	5.67	2.58	31.07	32.97	0.286	33.80 ± 215.35
Disposal due to expired thaw (mL)	21.77 [a]	7.29 [ab]	11.07 [ab]	0.84 [b]	8.93 [ab]	7.23 [ab]	<0.001	9.52 ± 19.41
Disposal due to validity expiration (mL)	3.97	4.94	9.60	0.00	4.17	5.00	0.363	4.59 ± 22.22

NICU: Neonatal Intensive Care Unit; Groups presenting different letters are statistically different from each other; The Kruskal-Wallis test was used for comparison of the months.

There was a positive correlation between the HBM inflow to the NICU and the HBM outflow. This correlation was moderate, presenting values of $r = 0.659$ and $p<0.001$, with directly proportional variables. Therefore, the greater the inflow of HBM to the NICU, the greater its outflow.

DISCUSSION

In this present study, it was possible to observe a high percentage of HBM expression and also consumption by the NICU. The majority of HBM expressed by mothers of infants hospitalized in the NICU was sent to the infants, with only 5.73% of this total being discarded. The values of standard deviation for disposal are high, since it is considered zero on most days, while a high value may occur in a single day, mainly due to discharges and deaths, when large volumes of stored milk are discarded. In relation to the months of the study, the variables total inflow of HBM and NICU inflow presented increased values during the months of July and August. Possibly, such difference observed in those values is explained by the fact that they show more births, in relation to the other months studied, or because the mothers expressed more frequently and/or expressed a higher quantity. The high values of HBM inflow and outflow for the NICU, as well as the low values of disposal, reinforce the quality of the milk dispensary and its importance in health promotion. Most of the time, they are premature babies, who need all the benefits brought by breast milk, even in cases where they cannot suck the breast yet, but make use of the expressed milk with use of small cups or probes, discouraging the use of baby bottles.

The literature is scarce when it comes to the amount of HBM used in NICUs and milk dispensaries. However, there is some data available on the inflow and outflow of HBM at the Human Milk Collection Center of Conceição Children's Hospital in Porto Alegre, Rio Grande do Sul,. Considering the same period of the present study, the human milk collection station of the Conceição Children's Hospital obtained 90,100 mL of HBM collected over the last 180 days of the year 2016, with a daily average of 500.55 mL. Of this total, 62,200 mL of HBM were distributed, with a daily average of 345.55 mL over the semester. The volume distributed was divided among 308 recipients[15]. However, unlike the present study, there is no data on the amount of HBM destined for the NICU.

The Human Milk Collection Center of Conceição Hospital in Porto Alegre had a percentage of HBM consumption of 69% (62,200 mL) during the last semester of the year[15]. In the same period, the milk dispensary of Caxias do Sul General Hospital obtained an even higher percentage, reaching 87.21% (134,216 mL) of use in relation to the HBM collected, which demonstrates the high utilization of all the expressed milk. Likewise, the values regarding the use obtained in the general hospital were higher than the distribution percentage of milk banks of the state of Rio Grande do Sul [15].

Along the 12 months of 2016, the state reached 5,643,400 mL of collected milk and 4,266,600 mL of milk distributed, coming from 15,651 donors and having 16,253 recipients. A total of 75.6% of this milk collected was used throughout the state[16], which shows that the milk dispensary of the general hospital presents a total utilization above the numbers found in all milk banks in the state of Rio Grande do Sul.

Rio Grande do Sul has nine milk bank facilities, most of them in the state capital of Rio Grande do Sul. A human milk bank is a unit specialized in NICU, and one of its tasks is to stimulate the donation of breast milk for feeding hospitalized newborns. They are responsible for the pasteurization and distribution of human milk, taking into account the needs of the baby[17].

The milk dispensary of Caxias do Sul General Hospital serves mothers of hospitalized children who need to express breast milk. Because of that, the amount of HBM that is entered in the sector is high, resulting from the sum of all these numbers, that is, all hospital units, although the largest number represents HBM expressed by the mothers of patients in the NICU. The percentage of HBM inflow destined for the NICU was 86.92% (153,898 mL).

It is important for the stimulation of lactation that mothers of newborns admitted to neonatal units receive adequate guidance and be encouraged to initiate early milk expression. In addition, maternal anxiety and concern about the newborn may lead to delayed onset of mammary expression and inhibition of milk ejection. These factors combined can determine milk insufficiency[18].

The higher the amount of milk expressed, the greater the amount of milk sent to the infants in the NICU, who are the biggest beneficiaries of this practice. Breastfeeding is the first step in promoting the health of a newborn. Regarded as the baby's first vaccine, colostrum is rich in nutrients and anti-infective properties that protect the baby by boosting immunity[10].

Keeping mothers' milk expression in inpatient settings is even more special because this offers protection for this baby in such a delicate moment like the beginning of life. The family and hospital network should support and encourage this mother to maintain the practice of milk expression in order to enhance the milk production and for her child to receive all the necessary nutrients from breastfeeding[18], and thus prevent the use of industrialized infant formula.

It is important that breastfeeding be initiated shortly after delivery, if possible, since the early stimulation of the breasts, especially before 48 hours, seems to be critical for the maintenance of adequate milk production in subsequent weeks[19]. Besides the physiological aspect of the mother in producing milk to be expressed, it is worth pointing that the emotional aspect, the mother's desire to breastfeed and the support of the family are essential for the lactation and continuity of breastfeeding[20]. A recent study assessed the impact of donor milk use in NICUs of California, and associated the availability of a human milk donor bank in a hospital with an average increase by 10% in the NICU breastfeeding rate[21].

The Human Milk Collection Centers and milk banks carry out the collection and storage of milk, in compliance with the regulations of RDC no. 171. In the breastfeeding support rooms, where the general hospital fits, the collection and storage of breast milk is intended exclusively for the child's own feeding, different from the pasteurization process that occurs in Human Milk Banks[14], which enables the use of HBM from any mother for all babies. The milk dispensary structure is not suited to perform pasteurization of the milk expressed, making it impossible to have the breast milk from a sole donor used for all hospitalized infants. If that were possible, the HBM disposal resulting from discharge/death would not exist, because this milk would be used to feed other babies, whose mothers do not have or do not express HBM, or even express their milk in insufficient quantity for the feedings.

The nursing woman must follow some guidelines prior to collection, such as: wear mask, keep hair tied and covered by a cap, perform hygiene of hands, arms and nails with soap and clean breasts only with warm water, and dry them with a disposable towel. During milk expression, it is recommended that mothers avoid talking, and that the first jets or drops of milk from the breasts be discarded[14]. Failure to do any of these steps correctly, especially the hygiene of the breasts, render the expressed milk liable to present impurities that can be seen with the naked eye, being necessary to dispose of it. Impurities occurs when there is any foreign body in human milk, such as fragments of skin, hair and clothing threads, which disqualifies the product for consumption, making it is necessary to discard the entire volume of the container. There is great turnover of professionals in the hospitals, which allows periods with technicians without proper training, which is the probable cause for persistence of the result of milk disposal related to the item of impurities[22].

As for the values of disposal resulting from impurities in the current study, the daily average over the semester was 128.31 mL. The value of disposal of milk containing impurities may be improved through greater attention to guidance on the expression, better hygiene of the breasts and intensified training for those who guide the mothers, emphasizing the importance of the multidisciplinary work. The items of disposal are low, and may be even smaller if the techniques of hand and breasts hygiene, and use of personal protective equipment in the milk expressing room are made more accurately, in addition to expressing per container the amount that is required per feeding for each baby, decreasing the risk of disposal due to expired thaw and achieving an even greater profit from the expressed HBM.

The recommendations for storage of HBM are: label the bottle with the name of the nursing mother, name of the newborn, date and time of collection, and store immediately in the freezer at a temperature of -3º C. The milk stored in a freezer is valid for 15 days and the thawed milk must be fully used within 12 hours[14]. Disposal after 12 hours from thaw and due to validity expiration after 15 days presented 9.52 and 4.59 mL of daily average over the semester, respectively, both of them obtaining little representation in the current research. Babies may consume a small volume per feeding, which also contributes to disposal resulting from thaw and/or validity expiration.

In 1990, the Baby-Friendly Hospital Initiative (BFHI) was implemented, a program that mobilizes health professionals to implement changes to routines and behaviors based on the conclusion of the "Ten Steps to Successful Breastfeeding", in order to promote successful breastfeeding. The initiative qualifies professionals to carry out evaluations and encourages hospitals to apply for accreditation[23]. The BFHI aims at informing health professionals and the community and working towards the adoption of laws that protect the practice of the nursing mother. Together with the National Breastfeeding Incentive Program, it supports the service routines that promote breastfeeding and combat the unrestricted advertising of baby milk formulas, including nipples, pacifiers and baby bottles[24].

The practice of EBF provides the child with numerous benefits, among them are: adequate child growth, protection against infection and better development of the muscles of the oral cavity, with positive effects even upon intelligence. The factors that exist in breast milk also contribute to reducing the risk of allergies, hypertension, high cholesterol and diabetes mellitus, reducing the risk of future obesity[9].

A limitation of the present study was the collection data, in which quantities of milk may have been collected the day before starting the study, and quantities used and/or discarded one day after the study, which prevents the values of inflow, outflow and disposal of the milk dispensary from totaling up the exact value of 100%.

Each of the patients receives a specific amount of milk, with different schedules, and each mother has its own rate of of breast milk expression. The present study did not evaluate separately the amount for each newborn, nor how many donor milk feedings there were, but only the amount received by the milk dispensary and consumed by the NICU. A perspective for future studies would be the comprehensiveness of the analysis, assessing the number of mothers who expressed their breasts and the number of babies who received the HBM, extending the study beyond the milk dispensary, to the NICU as well, monitoring the patient from hospital admission up to discharge, enabling the identification of the amount of breast milk collected and the amount of breast milk used for each baby in a NICU.

CONCLUSION

The present study concludes that the milk dispensary under analysis presented high percentage of human milk expression and consumption and a low disposal, demonstrating a good storage control and its value within the baby-friendly hospital.

CONFLICT OF INTEREST

The authors declare that there were no conflicts of interest.

CONTRIBUTIONS

Manoella Pires Pinzon participated in the design of the study, data collection, data analysis, writing the manuscript and final revision. **Fernanda Oliveira Marques** participated in the design of the study, writing the manuscript and final revision. **Bruna Bellincanta Nicoletto** participated in the study design, data analysis, writing the manuscript and final revision.

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